



## Early Journal Content on JSTOR, Free to Anyone in the World

This article is one of nearly 500,000 scholarly works digitized and made freely available to everyone in the world by JSTOR.

Known as the Early Journal Content, this set of works include research articles, news, letters, and other writings published in more than 200 of the oldest leading academic journals. The works date from the mid-seventeenth to the early twentieth centuries.

We encourage people to read and share the Early Journal Content openly and to tell others that this resource exists. People may post this content online or redistribute in any way for non-commercial purposes.

Read more about Early Journal Content at <http://about.jstor.org/participate-jstor/individuals/early-journal-content>.

JSTOR is a digital library of academic journals, books, and primary source objects. JSTOR helps people discover, use, and build upon a wide range of content through a powerful research and teaching platform, and preserves this content for future generations. JSTOR is part of ITHAKA, a not-for-profit organization that also includes Ithaka S+R and Portico. For more information about JSTOR, please contact support@jstor.org.

## P U B L I C A T I O N S

O F   T H E

# Astronomical Society of the Pacific.

---

VOL. X.

SAN FRANCISCO, DECEMBER 1, 1898.

No. 65.

---

### A GENERAL ACCOUNT OF THE CHABOT OBSERVATORY – PIERSON ECLIPSE EXPEDITION TO INDIA.

By CHARLES BURCKHALTER.

It was by the public spirit and generosity of a valued member of this Society, Past-President WM. M. PIERSON, and the kindness and liberality of the Board of Education of the city of Oakland, that it was possible to send an expedition from the Chabot Observatory to India to observe the total eclipse of the Sun, on January 22, 1898.

Mr. PIERSON not only gave me more money than I had estimated as necessary, but had me arrange a telegraphic code, so I could send for more in an emergency, and then, as though this were not enough, he said, "Of course, your family will come to me if they need anything while you are away!"

J. W. McCLYMONDS, Superintendent of Schools and Director of the Observatory, Mr. YORK, Assistant Superintendent, and W. C. GIBBS, of this city, gave me needed help, and Mr. HENRY KAHN, of San Francisco, loaned me valuable instruments for the expedition.

Knowing by experience on the expedition to the island of Yezzo, in 1896, that steel rails and the most delicate astronomical instruments look alike to the coolies who handle freight in the Far East, I was much concerned lest an accident should happen to the objective of the Pierson photographic telescope, presented to this Observatory by Mr. PIERSON, in 1895, for the expedition to Japan — which would cause the failure of the expedition. I resolved to procure, if possible, a duplicate lens, and appealed in

this emergency to a member of the Society, Dr. GEORGE C. PARDEE, of this city, who readily consented to present the extra objective, and it was ordered at once from BRASHEAR, the maker of the Pierson lens. As in all probability both objectives would reach the station safely, I fitted a tube for the new lens, which, with plate-holders, exposure-shutters, etc., was also provided by Dr. PARDEE, and mounted it upon the Pierson tube, thereby having two important instruments, the new lens to be used to obtain a duplicate set of negatives, the exposures in both telescopes, being electrically controlled, being identical. The plates in the Pierson telescope having the exposures controlled by a diaphragm, and the Pardee plates being exposed in the ordinary way, would thus give strictly comparable negatives. All the work of preparation, including a new and novel equatorial mounting, was done with my own hands, during leisure time, my regular work being carried on until two weeks before sailing.

After an amount of preparation, detail, and anxiety, only to be appreciated by those who have undertaken similar expeditions, I sailed, all alone, for "a point or points in India," as the insurance policy on the instruments declared, with nearly two tons' measurement of apparatus to look after and be responsible for getting to the proper place and adjustment, and successfully managing the thousand details that go to make up an expedition. I sailed from San Francisco on October 30th, in the fine steamer *Belgic*, and had the exclusive use of a good stateroom, Mr. PIERSON himself coming down to the ship to see that I lacked for nothing.

The ship called and stopped from one to three days at Honolulu, Yokohama, Kobe, Nagasaki, and Shanghai, reaching Hong Kong on November 28th, whence I was to transfer to the P. & O. steamer *Ganges*, which had not yet arrived. The voyage had been pleasant throughout; good weather and fair winds prevailed. Bathing in a big tank on deck, tenpins, cricket, and other games helped to pass the time pleasantly, and the stops at some of the ports gave me an opportunity of renewing friendships made a year before, and when the ship reached her destination, I left her with regret.

Captain RINDER allowed my instruments to remain in the ship until the *Ganges* arrived, when they were transferred by a special lighter, thus saving much handling. Upon requesting the officers of the *Ganges* to handle the instruments carefully and "stow cool," the obliging chief officer had them placed over the

captain's cabin, covered with several tarpaulins and awnings — an ideal place for the hot tropical voyage ahead.

On December 2d, we sailed from Hong Kong for the last half of the voyage, and after the usual sightseeing of leaving port, I started for my stateroom. I say "my," for I had the exclusive use of a good deck room; but only a casual inspection established the fact that *our* stateroom was occupied jointly by myself and innumerable cockroaches and ants. That night, while he was holding court, I caught the king-cockroach, whose length measured over three inches. A Californian had presented me before sailing from home with a basket of choice apples, and, as one soon sickens of tropical fruit in the tropics, they were greatly appreciated; but I found that they were also highly esteemed by the rats on the *Ganges*; for, on account of the heat, cabin-doors were left open, and these permanent passengers invaded my room and left me only three out of about twenty-five, which was not a fair division. When I called the attention of the chief steward to it, he expressed unbounded astonishment — that the rats had left any at all! and it was painfully evident that I was no longer on the *Belgic*. On the voyage to Singapore, a sea came down the companionway and flooded the after-cabin, and nearly ruined the wardrobes of a San Francisco merchant, Mr. HENRY PAYOT, and his wife, and after this, a worse calamity followed; for the rats took and held possession for a couple of days, or until he hired the stewards to clear the room, to all of which the chief engineer facetiously remarked that no one was to blame, as "water and rats are the Queen's enemies"! Were it not for the kind and gentlemanly deck officers, I could not say a single good word for the *Ganges*.

A stop of a day at Singapore and some hours at Penang, gave plenty of time to visit the principal features of those places, and the three days at Colombo were used for a trip into the mountainous interior, to the old capital, Kandy, and the beautiful government botanical gardens at Peradeniya, where one may revel in the superabundance of tropical vegetation. Here every known spice in the world grows to perfection. Truly, Ceylon, "the pearl of India," is a land "where every prospect pleases," and the one land in the Far East in which I would have lingered longer. Another short run of a thousand miles, brought me to Bombay, fifty-two days from San Francisco, after a fine voyage of thirteen thousand miles.

Within an hour after reaching Bombay, I was about the

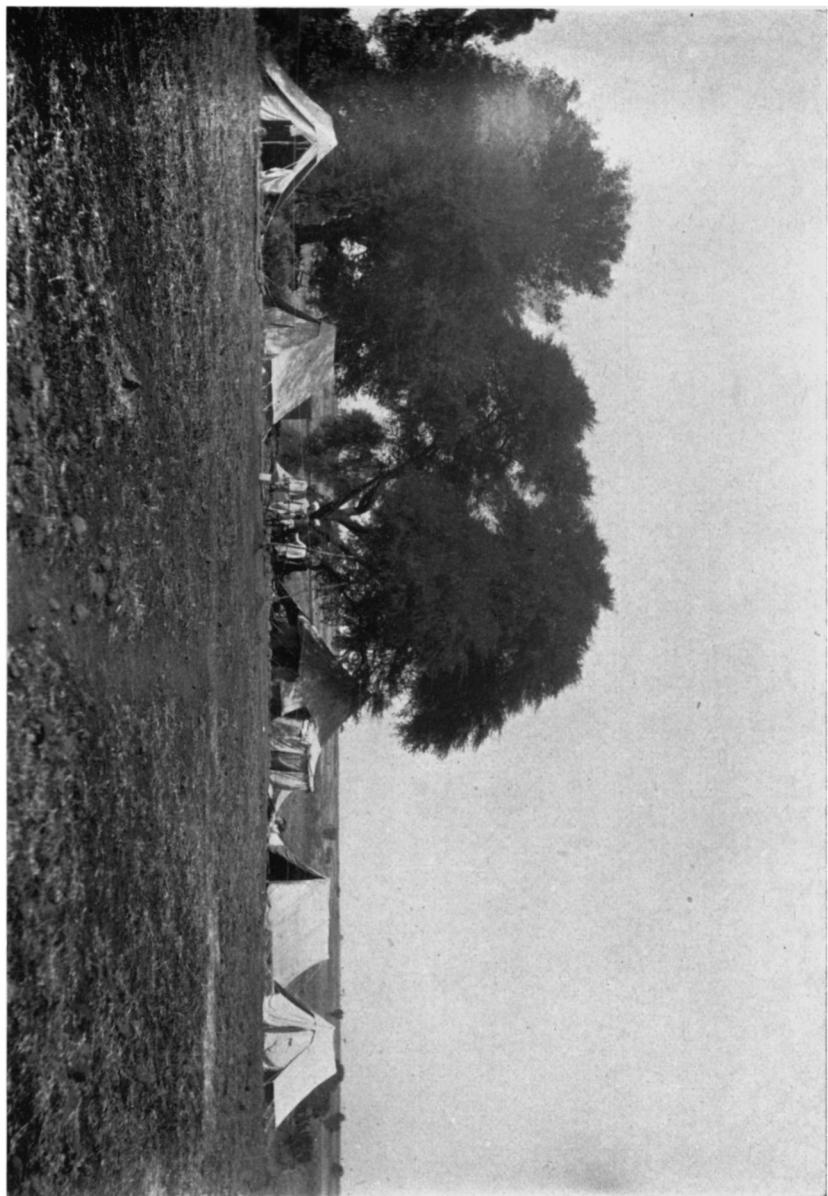
"King's business." I went at once to the customs office — that dreadful bugbear of travelers — to see just how I was to go about unwinding the usual red tape. Before leaving home, I had written to our Secretary of State, asking him to request our consul at Bombay to assist me in passing the instruments through the customs department with the least possible amount of unpacking. I asked the Indian official just what I must do, and, in turn, was asked the nature of the freight and my name. "Oh!" exclaimed the officer, "the government has passed a resolution about it, and you need not open anything!" This was not as surprising as it was gratifying; for I had hoped for something of the kind, and our consul, Major COMFORT, had arranged to have them passed without inspection. Even my personal baggage was not examined, my word that I had nothing dutiable being taken without question; the same courtesy being shown me in England on my way home, through the thoughtfulness of the Astronomer Royal, Dr. CHRISTIE, who was a fellow-passenger part of the voyage from Bombay.

Major COMFORT called upon me a few hours after the ship arrived, and all difficulties seemed to melt in his genial presence, each government official being, apparently, greatly interested in all things "eclipse-wise."

Where to establish the station was now a question of paramount importance. The farther south and west, the longer the time of totality; but near the coast there was a greater probability of clouded skies — not at all probable, however, anywhere.

The government representative, Professor NAEGAMVALA, suggested Indapur, where a bungalow was awaiting me; but finding that the instruments must be carried across a small river in a primitive ferry-boat, not large enough to carry a bullock-cart, I declined to take any risk whatever, and I finally decided upon Jeur, a "jungle" station on the line of the Great Indian Peninsular Railway.

For the first time I must lose sight of the instruments, and careful handling in transporting them to the interior was necessary. I called upon Mr. W. H. NICHOLSON, assistant traffic manager of the Great Indian Peninsular Railway, and it was a pleasure to see the cheerful interest he took in all my plans; he gave me the use of a "wagon" (car), no other freight being allowed in it, and a letter to agents instructing them to use great care in handling them, and to allow me to superintend loading,



GENERAL VIEW OF CAMP PIERSON, NEAR WANGI, INDIA.

and also directed that the car stand at Jeur without demurrage until I arrived, so that I could see to the unloading myself; thus every transfer was made in my presence from the observatory to the eclipse station. The company gave half rates to observers and their servants, and very low rates for instruments. This genial gentleman also assisted me on the day of the eclipse.

The instruments going by freight-train were forwarded at once, while I remained to employ a cook and interpreter, and to buy provisions and camp equipments; for all these must be procured in Bombay.

The bubonic plague now became a troublesome factor; the first three cooks I hired deserted when they found where I purposed going, as the plague had appeared only twenty miles away from the proposed camp, and subsequently came within seven miles, and was raging violently at Poona, the nearest large city. The proprietor of the hotel now came to my assistance, and said if I would wait two days he would get me "the best man in India." Of course, I waited for this remarkable person, and he arrived in due time. He was a native of Madras, with the English name of Caleb Phillip, but I knew him only as "Mustapha." He agreed to stand by me, plague or no plague; and as he said he could speak all the "longwidges," he could also act as interpreter. I do not know whether he was "the best man in India" or not, but I found him to be honest, industrious, and competent. He was a "Christian," although he indulged frequently in a mild type of profanity, and his general knowledge was invaluable to me, and I came to regard him more like a friend than a servant.

The station selected was in what is known as the "jungle," about six miles from Jeur railway station, near the little village of Wangi, in the Deccan, about two hundred and twenty miles southeasterly from Bombay, in the midst of a famine district — this being the second failure of crops in as many years, with plague east, west, and south of us. My camp — named Camp Pierson — was near one of the great irrigation wells, from which water was drawn daily for ten hours, with from two to four yoke of bullocks, and was shaded by some large babool and tamarind-trees, which added greatly to my comfort and capacity to work during the heat of the day.

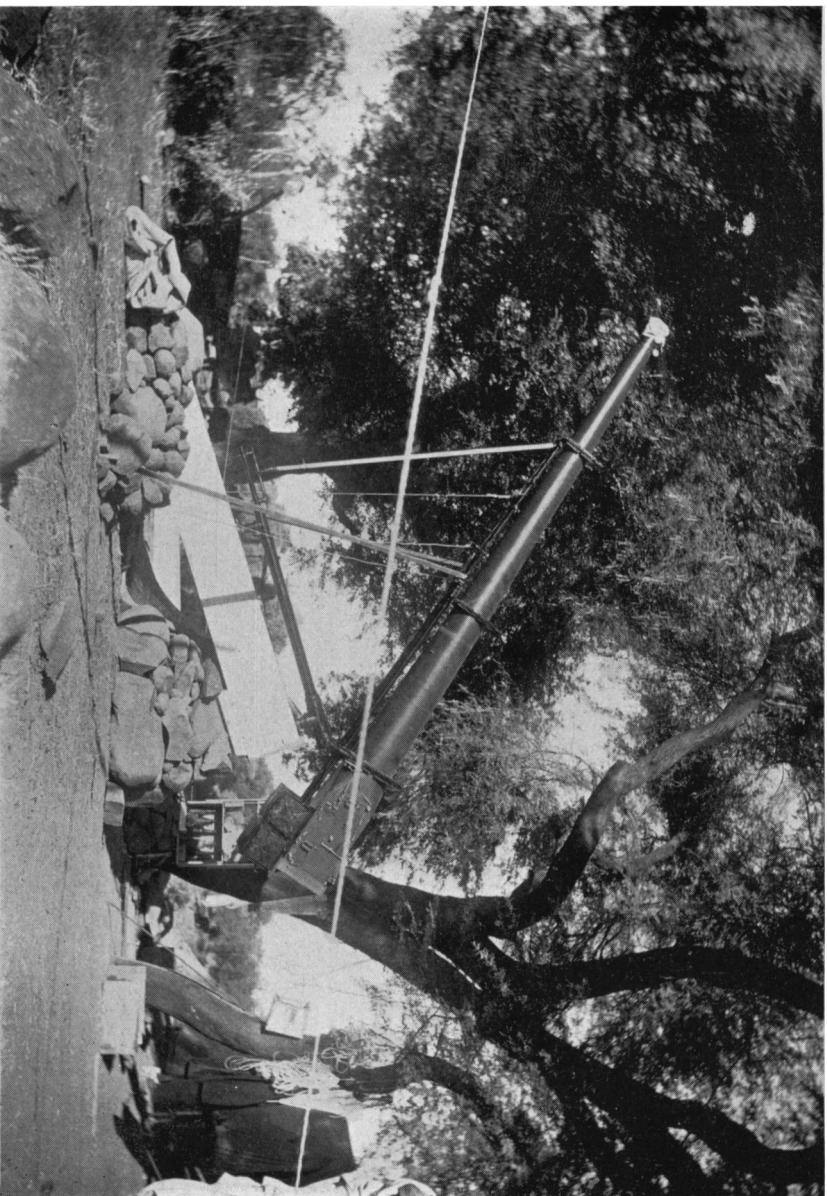
Professor CAMPBELL, of the Lick Observatory-Crocker Expedition, occupied a station about two miles nearer Jeur, and I desire to express my gratitude to the Professor and the ladies

of his party for their hospitality while my own camp was being prepared, and for the many pleasant visits I received from them, almost daily.

The Indian Government furnished observers with tents, I having two, and subsequently four more for my European assistants, also, a policeman, and a sweeper (scavenger) who came to the camp twice daily.

I was assisted in all matters of selecting camp, employing help, etc., by Mr. DAJI DHONDEV PATANKAR, the Mamlatdar of Kermala, the highest official in that part of the country, and who, by instruction of the government, attended to the wants of observers, in person or through the village *patils* (officials). He was all-powerful in his district, and no one thought to question an order from the Mamlatdar. He established the price of eggs, milk, wood, and all such articles, and fixed the price of labor at *four cents* per day; but "Sahib CAMPBELL" had utterly demoralized the labor market by paying six cents, and I was expected to do, and did, likewise, although hundreds of men could have been employed for two or three cents a day — about all they were worth. The money spent by the various astronomical expeditions must have relieved the distress in many families; for so great were their necessities, that a large part of the population of the village was out daily gathering seeds from grass and weeds for food to keep soul and body together. One morning, before sunrise, a man, with his wife, mother, and three half-grown children, came into a field near the camp and worked all through the day until twilight. I bought the seed they gathered, which, after cleaning, just filled an eight-ounce bottle, and this was to have been their only food for the next twenty-four hours; and yet, with all their misery, they were kind to me, and brought me presents of pigeons, fruit, and wild honey, and were exceedingly grateful for a dozen packages of various kinds of vegetable seeds I took with me, as being likely to grow in a hot, dry climate, and which, if they can be successfully grown, will prove a greater blessing than any other thing I could have given them.

The work of unpacking, setting up, and adjusting instruments began at once, everything having arrived in perfect order; but I labored under many difficulties, expected and unexpected, materials not being obtainable. Lumber was the great drawback, none being nearer than Poona, a hundred miles away. Coal-oil boxes from the village "bazaar" were used freely as a substitute,



THE PIERSON PHOTOGRAPHIC TELESCOPE, AS MOUNTED IN INDIA.

for some sort of a daylight "dark-room" was necessary, and particular care was required to guard against the multitudinous insect life, especially the white ant, which is exceedingly destructive of wood. I repeatedly drenched the wood piers of the telescope and a liberal patch of ground all around them with coal-oil, which effectually protected them, and it required my best efforts to keep provisions, clothing, and everything eatable out of harm's way. Centipedes existed in great numbers, and I killed two snakes within ten feet of my tent, whose poisonous bite was rated at "death in six hours," and "death in twelve hours," etc., besides a "king" cobra of unusual size, while in company with the Mamlatdar, on the way from Jeur, which I carried to Professor CAMPBELL's camp in triumph. The howling of jackals prevented sleep for a few nights, but I soon became accustomed to their cry, while wild peafowls and monkeys furnished diversion during the day.

I received many visits from local officials, the village *patils* calling from two to five times daily, and were ever ready to assist me. Their principal business, however, was to furnish labor and keep beggars and curious natives away, who often came from miles away to see "Sahib" take his meals, and I seldom dined without interested observers. The cook, Mustapha, was next to the Mamlatdar himself, the most important man in the neighborhood, and did not hesitate to inflict corporal punishment with a stout stick, which he kept for the purpose, when outsiders crossed the line marking out the camp limits, or while "Sahib" was asleep. He took full charge of the domestic arrangements and was thoroughly efficient, and it seemed to me he knew everything, having traveled extensively in India.

The work of getting instruments into position and adjustment was pushed with all the vigor possible. The Pardee lens had not been tested for focus and other necessary adjustments before leaving, on account of the press of other duties, leaving much to do after arrival at the station, where it entailed much night-work, with only the most ignorant coolies, who wondered what all this fuss was about, for assistants. My average day's work during the thirty-seven days in camp, was not less than sixteen hours a day, and much of this under a fierce Indian sun that must be felt to be appreciated.

One condition, however, was very comforting; this same sun, rising and setting blazing hot every morning and evening, with-

out a cloud or fleck in the sky to mitigate the heat, gave promise of a clear sky on eclipse day, and the great source of anxiety on an eclipse expedition—the weather—was hardly considered. On one afternoon only, a slight filmy cloud appeared, but only for a few minutes, and during the entire stay in the Deccan with this exception, not a cloud was seen. The nights, however, were cold toward morning; the thermometer reading as low as forty-two degrees at six A. M., which seemed bitterly cold, and ninety-six the same day at eleven.

I had four English gentlemen for assistants on the day of the eclipse;—Major T. R. HARKNESS and Captain DUHAN, of the Royal Artillery; Mr. W. H. NICHOLSON (mentioned above) and Mr. W. H. HUSSEY, of the G. I. P. Railway. These gentlemen came from Bombay at their own expense, and with their retinue of servants strained my modest camp resources. The Indian servant, however, is always expected to take care of himself, and as it is the custom of foreigners in India to carry their own bedding, we—*i. e.* Musta<sup>n</sup>ha and I—managed very nicely, and many times he came to me with plans for the entertainment of our distinguished guests, that he thought, if successfully carried out, would certainly dazzle them and reflect great credit on the expedition, and when I left India he had not yet ceased to congratulate himself and to brag about the general success of the manner in which we cared for our visitors.

My assistants reached camp on the morning of the day before the eclipse, and after thorough instruction in the parts they were to take, we began to practice, going through the programme many times that day, and after sunset, when the light was about the same as during the eclipse. Each man's part was carried out perfectly, and thus another source of anxiety was eliminated, my own part being least perfect, although I had rehearsed it on many days.

On the morning of the eclipse, the finishing touches were given, and everything tested and found perfect. I was ready. The government had brought a large body of police to the district to keep all but invited guests out of the camps; for, a great excursion from Bombay and other cities had brought many people to witness the great phenomenon. The police took complete charge of the roads at 6 A. M., and I had to send one of the policemen assigned to me on an errand, no private person being allowed to pass. They also prevented the usual howling and



THE PIERSON TELESCOPE, WITH THE PARDEE LENS AND TUBE ATTACHED.

brush-fires, "to scare the devil away," as the smoke might interfere with the work of the astronomers.

The day was perfect, and in perfect readiness we waited for the supreme moment, and at the given signal, in perfect silence, we again carried out the programme with machine-like precision—this time with powder and ball, so to speak. Two minutes!—and whatever the result, it was securely shut up in the ten plate-holders, carefully placed in my own tent to await development.

Only one word—"Look!"—was spoken, and that was agreed upon, so that all for about ten seconds might see the corona. While there was plenty of enthusiasm, there was no excitement or nervousness, and my confidence in my assistants was absolutely unbounded, and their work was simply perfect.

We watched the great shadow-cone as it swept northeasterly, the edges being distinctly visible; but I had no time to observe any of the usual phenomena, only noting that the light during totality was much greater than during the eclipse of January, 1889, which I believe was due to the great amount of dust in the atmosphere.

In the evening my assistants left me for their homes, and I began the task of developing. The weather conditions were exceedingly unfavorable; dust everywhere, the water too warm to develop, and no ice to be obtained, and nothing could be done except between midnight and dawn, when the water became cool enough.

Upon developing, I found the Pardee plates exquisitely sharp and perfect; but as they were made in the usual manner, they show no more than other good plates; while the Pierson plates, where the exposure was controlled by a new device, show the fine details, flames, and streamers at the Sun's limb, and an extension of the corona equal to two and one half diameters of the Moon, all upon the same plate, something never before accomplished, and giving almost perfection. My judgment, however, was at fault, as this was the first trial of the method; but I learned much concerning the brightness of the extreme inner corona (it has always been underrated), and the errors made can easily be corrected in future eclipses.

The plates—of which two were broken on the journey home, but have lost none of their scientific value—will be carefully studied this winter, and the full details of the apparatus and discussion of the results will be published separately.

On account of the extreme dryness of the air and the constant dabbling in photographic chemicals, my hands were in a dreadful condition, and pained me so that sleep was almost impossible, and the all-day and nearly all-night work of the last ten days reminded me of some misguided friends at home, who had never been with an eclipse expedition, and who "hoped I'd have a nice time"! In seven days after the eclipse I finished the work, and with a string of bullock-carts, and followed by half the population of Wangi, I started for the railway station and civilization, tanned beyond recognition, and with hands swollen and calloused like a laboree's.

The Mamatdar drove the villagers back, but about a dozen begged to be allowed to go with "Sahib" to the station, and, at my request, he allowed them to go. I parted from some of them with regret, and shall long remember this little Indian village and its dusky citizens.

Again my friend Mr. NICHOLSON placed me under obligations by telegraphing permission to ride over the Ghauts Mountains on the engine, in order that I might see to advantage that marvellous piece of railway, of twenty miles in length, which required five and a half years to build!

The instruments came home by way of China, while I continued my journey — ever westward — *via* Aden, Suez Canal, and Europe, reaching home on April 16th, after an absence of nearly six months.

Among the experiences of the return journey were a quarantine at Ain Musa (Moses's Wells) in Arabia, on account of the bubonic plague in Bombay, and a short visit to Egypt and Palestine; but, as a friend has recently said in this journal, this "is not an astronomical story."

In closing, I wish to express my appreciation of the help received from Major COMFORT, Major HARKNESS, Captain DUHAN, Mr. NICHOLSON, Mr. HUSSEY, and other friends in far-away India — not forgetting my faithful Mustapha — who did so much for me, and all in their power for the success of the expedition.

OAKLAND, CAL., November, 1898.

THE "EYE-END" OF THE PIERSON TELESCOPE.

